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FY 1999 - FY 2001

Very limited information exists concerning the prototype performance of Reclamation's selective withdrawal structures. To date, over \$100 million has been spent on adding selective withdrawal capability to Reclamation dams to improve release water quality. However, minimal resources have been expended toward the evaluation of these structures after they are put into service.

The objectives of this project are to develop and carry out a systematic program to document performance of Reclamation's existing selective withdrawal structures so that future designs can be based on prototype data, along with hydraulic model study results. This includes making prototype measurements of selective withdrawal performance. These data sets will document performance and can be used to calibrate and validate numerical models which are used for operational planning studies. Head loss measurements at different submergence levels will be made to determine loading on the structure. Internal velocity measurements will allow determination of head loss coefficients. Existing submergence criteria will be evaluated for adequacy. If necessary, approach velocities will be measured using acoustic velocimeters or acoustic Doppler current profilers to determine the withdrawal zone characteristics. Withdrawal zone information is especially useful in developing models predicting the release temperatures and/or other water quality parameters, as well as fish entrainment studies.

To date, this project has focused on the Shasta Dam Temperature Control Device (TCD). One major accomplishment has been development of a real-time temperature monitoring program at Shasta Dam. All five penstocks at the dam have been instrumented and every 15 minutes water temperature data are sent via satellite telemetry to an Internet accessible database. Temperature monitoring is required at these locations to determine the selective withdrawal performance of the TCD. Since early April, this monitoring system has been online, and a database of TCD operations has been maintained. Working together with Central Valley Project operators, much progress has been made in documenting TCD performance for a wide range of operations. This year, a monitoring program was developed to collect Shasta forebay temperature profiles with a string of temperature loggers. Meteorological data at Shasta Dam are also being collected from Reclamation's Hydromet database. Temperature profiles, TCD operations, penstock flows and temperatures, and meteorological data are needed as input for numerical simulation models. This year, Water Resource Research Laboratory (WRRL) staff initiated the development of a computational fluid dynamics (CFD) model of the Shasta TCD. This fiscal year, we have modeled 10 operational scenarios with a high degree of success (Higgs and Vermeyen, September 1999).

Our participation in the 5th U.S. - Japan Workshop on Hydrology and Water Resources (Summary Report, 1999) allowed initiation of a cooperative research exchange on the topic: Reservoir Operation Methods for Sustaining Water Quality and Ecosystems. Participation in this program is a technology transfer opportunity which will benefit both Reclamation and Japan's Public Works Research Institute.

Northern California Area Office and Central Valley Operations personnel have contributed significant time and materials to the temperature monitoring program. The Mid-Pacific Construction Office funded the Shasta TCD CFD modeling project. The Water Resources Research Laboratory also provide CFD modeling capability to this project.

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Note: Many of these references are available on the website: <http://www.usbr.gov/wrrl/tvermeyan>